

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 2

**Amendments to the Claims:**

**This listing of claims will replace all prior versions, and listings, of claims in the application:**

1. (Previously Presented) A method for manufacturing a semiconductor device comprising:

forming a semiconductor film over an insulating surface;

forming an oxide film on the semiconductor film;

radiating the semiconductor film with a first laser beam using a lens;

radiating the semiconductor film with a second laser beam after radiating with the first laser beam; and

radiating the semiconductor film with a third laser beam after radiating with the second laser beam,

wherein a wavelength of the second laser beam and a wavelength of the third laser beam are different from a wavelength of the first laser beam.

2. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 1, wherein a crystallized semiconductor film is formed after radiating the semiconductor film with the first laser beam.

3. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 1, wherein the oxide film on the semiconductor film is removed after radiating the semiconductor film with the second laser beam.

4. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 1, wherein a surface of the semiconductor film is level after radiating the semiconductor film with the second laser beam.

5. (Canceled)

10785204.1

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 3

6. (Original) The method for manufacturing the semiconductor device according to Claim 1, wherein an energy density of the first laser beam is 300 to 500mJ/cm<sup>2</sup>.

7. (Currently Amended) A method for manufacturing a semiconductor device comprising:

forming a semiconductor film over an insulating surface;

forming an oxide film on the semiconductor film;

radiating the semiconductor film with a first laser beam;

radiating the semiconductor film with a second laser beam after radiating with the first laser beam under an atmosphere comprising at least one of hydrogen and an inert gas; and

radiating the semiconductor film with a third laser beam after radiating with the second laser beam;

wherein a wavelength of the second laser beam and a wavelength of the third laser beam are different from a wavelength of the first laser beam.

8. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 7, wherein a crystallized semiconductor film is formed after radiating the semiconductor film with the first laser beam.

9. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 7, wherein the oxide film on the semiconductor film is removed after radiating the semiconductor film with the second laser beam.

10. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 7, wherein a surface of the semiconductor film is level after radiating the semiconductor film with the second laser beam.

11. (Canceled)

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 4

12. (Original) The method for manufacturing the semiconductor device according to Claim 7, wherein an energy density of the first laser beam is 300 to 500mJ/cm<sup>2</sup>.

13. (Currently Amended) A method for manufacturing a semiconductor device comprising:

forming a semiconductor film over an insulating surface;

forming an oxide film on the semiconductor film;

radiating the semiconductor film with a first laser beam;

radiating the semiconductor film with a second laser beam after radiating with the first laser beam; and

radiating the semiconductor film with a third laser beam after radiating with the second laser beam under an atmosphere comprising at least one of hydrogen and an inert gas,

wherein a wavelength of the second laser beam and a wavelength of the third laser beam are different from a wavelength of the first laser beam.

14. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 13, wherein a crystallized semiconductor film is formed after radiating the semiconductor film with the first laser beam.

15. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 13, wherein the oxide film on the semiconductor film is removed after radiating the semiconductor film with the second laser beam.

16. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 13, wherein a surface of the semiconductor film is level after radiating the semiconductor film with the second laser beam.

17. (Canceled)

18. (Original) The method for manufacturing the semiconductor device according to Claim 13, wherein an energy density of the first laser beam is 300 to 500mJ/cm<sup>2</sup>.

10785204.1

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 5

19. (Previously Presented) A method for manufacturing a semiconductor device comprising:

forming a semiconductor film over an insulating surface;

forming an oxide film on the semiconductor film;

radiating the semiconductor film with a first laser beam;

radiating the semiconductor film with a second laser beam after radiating with the first laser beam; and

radiating the semiconductor film with a third laser beam after radiating with the second laser beam,

wherein a pulse width of the second laser beam is smaller than a pulse width of the first laser beam, and

wherein a wavelength of the second laser beam and a wavelength of the third laser beam are different from a wavelength of the first laser beam.

20. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 19, wherein a crystallized semiconductor film is formed after radiating the semiconductor film with the first laser beam.

21. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 19, wherein the oxide film on the semiconductor film is removed after radiating the semiconductor film with the second laser beam.

22. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 19, wherein a surface of the semiconductor film is level after radiating the semiconductor film with the second laser beam.

23. (Canceled)

24. (Original) The method for manufacturing the semiconductor device according to Claim 19, wherein an energy density of the first laser beam is 300 to 500mJ/cm<sup>2</sup>.

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 6

25. (Previously Presented) A method for manufacturing a semiconductor device comprising:

forming a semiconductor film over an insulating surface;

forming an oxide film on the semiconductor film;

radiating the semiconductor film with a first laser beam;

radiating the semiconductor film with a second laser beam after radiating with the first laser beam; and

radiating the semiconductor film with a third laser beam after radiating with the second laser beam,

wherein an energy of the third laser beam is higher than an energy of the first laser beam, and

wherein a wavelength of the second laser beam and a wavelength of the third laser beam are different from a wavelength of the first laser beam.

26. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 25, wherein a crystallized semiconductor film is formed after radiating the semiconductor film with the first laser beam.

27. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 25, wherein the oxide film on the semiconductor film is removed after radiating the semiconductor film with the second laser beam.

28. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 25, wherein a surface of the semiconductor film is level after radiating the semiconductor film with the second laser beam.

29. (Canceled)

30. (Original) The method for manufacturing the semiconductor device according to Claim 25, wherein an energy density of the first laser beam is 300 to 500mJ/cm<sup>2</sup>.

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 7

31. (Previously Presented) A method for manufacturing a semiconductor device comprising:

- forming a semiconductor film over an insulating surface;
  - forming an oxide film on the semiconductor film;
  - crystallizing the semiconductor film by a heat treatment to form a crystallized semiconductor film;
  - radiating the crystallized semiconductor film with a first laser beam;
  - radiating the crystallized semiconductor film with a second laser beam after radiating with the first laser beam; and
  - radiating the crystallized semiconductor film with a third laser beam after radiating with the second laser beam,
- wherein a wavelength of the second laser beam and a wavelength of the third laser beam are different from a wavelength of the first laser beam.

32. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 31, wherein a crystallized semiconductor film having improved crystal characteristics is formed after radiating the semiconductor film with the first laser beam.

33. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 31, wherein the oxide film on the crystallized semiconductor film is removed after radiating the crystallized semiconductor film with the second laser beam.

34. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 31, wherein a surface of the crystallized semiconductor film is level after radiating the crystallized semiconductor film with the second laser beam.

35. (Canceled)

36. (Original) The method for manufacturing the semiconductor device according to Claim 31, wherein an energy density of the first laser beam is 300 to 500mJ/cm<sup>2</sup>.

Attorney Docket No. 740756-2683  
Serial No. 10/752,993  
Page 8

37. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 1, wherein the first laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

38. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 1, wherein the second laser beam is one selected from the group consisting of an excimer laser, ArF laser, and a KrF laser.

39. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 1, wherein the third laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

40. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 7, wherein the first laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

41. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 7, wherein the second laser beam is one selected from the group consisting of an excimer laser, ArF laser, and a KrF laser.

42. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 7, wherein the third laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

43. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 13, wherein the first laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

44. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 13, wherein the second laser beam is one selected from the group consisting of an excimer laser, ArF laser, and a KrF laser.

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 9

45. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 13, wherein the third laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

46. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 19, wherein the first laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

47. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 19, wherein the second laser beam is one selected from the group consisting of an excimer laser, ArF laser, and a KrF laser.

48. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 19, wherein the third laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

49. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 25, wherein the first laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

50. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 25, wherein the second laser beam is one selected from the group consisting of an excimer laser, ArF laser, and a KrF laser.

51. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 25, wherein the third laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.



Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 10

52. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 31, wherein the first laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

53. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 31, wherein the second laser beam is one selected from the group consisting of an excimer laser, ArF laser, and a KrF laser.

54. (Previously Presented) The method for manufacturing the semiconductor device according to Claim 31, wherein the third laser beam is one selected from the group consisting of an excimer laser, Nd:YAG laser, and a YLF laser.

55. (New) A method for manufacturing a semiconductor device comprising:  
forming a crystalline semiconductor film over an insulating surface;  
irradiating the crystalline semiconductor film with a laser beam in a gas selected from at least one of a hydrogen and an inert gas to level a surface of the crystalline semiconductor film.

56. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the inert gas is selected from the group consisting of nitrogen, argon, helium, neon, krypton and xenon.

57. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the crystalline semiconductor film is a silicon film or a  $\text{Si}_{1-x}\text{Ge}_x$  ( $0 < x < 1$ ) film.

58. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the insulating layer is a single layer film structure or a stacked structure of two insulating films formed on a glass substrate.

59. (New) The method for manufacturing the semiconductor device according to claim 58, wherein a thickness of the glass substrate is 0.4 to 0.7 mm.

10785204.1

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 11

60. (New) The method for manufacturing the semiconductor device according to claim 58, wherein the glass substrate is 1200 x 1600 mm or 2000 x 2500 mm in length.

61. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the laser beam is a linear laser beam.

62. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the crystalline semiconductor film is scanned by the laser beam plural times.

63. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the energy density of the laser beam is larger than 300 to 500 mJ/cm<sup>2</sup>.

64. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the laser beam is one of an excimer laser beam and a YAG laser beam.

65. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the laser beam is a XeCl laser beam.

66. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the crystalline semiconductor is heated at 450° to 600° after leveling the surface of the crystalline semiconductor.

67. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the crystalline semiconductor is heated by a RTA method after leveling the surface of the crystalline semiconductor.

68. (New) The method for manufacturing the semiconductor device according to claim 55, after irradiating the crystalline semiconductor film, a difference between top and bottom points of the surface of the crystalline semiconductor film is 6 nm or less.

Attorney Docket No. 740756-2683  
Serial No. 10/752,993  
Page 12

69. (New) The method for manufacturing the semiconductor device according to claim 55, wherein an energy density of the laser beam is  $430 \text{ mJ/cm}^2$  and a pulse width of the laser beam is 30 ns.

70. (New) The method for manufacturing the semiconductor device according to claim 55, further comprising a step of hydrogenating the crystalline semiconductor film.

71. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the gas is jetted to the crystalline semiconductor film from a nozzle.

72. (New) The method for manufacturing the semiconductor device according to claim 55, wherein a gas is jetted to the crystalline semiconductor film from below the crystalline semiconductor film.

73. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the semiconductor device is a display device.

74. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the semiconductor device is an active matrix type liquid crystal display device.

75. (New) The method for manufacturing the semiconductor device according to claim 55, wherein the semiconductor device is an electronic apparatus selected from the group of a video camera, a digital camera, a rear type or front type projector, a head mount display, a personal computer, a portable information terminal, a mobile computer, a mobile telephone and an electronic book.

76. (New) A method for manufacturing a semiconductor device comprising:  
forming a crystalline semiconductor film over an insulating surface, wherein a surface of the crystalline semiconductor film has a roughness;  
irradiating the crystalline semiconductor film with a laser beam in a gas selected from

10785204.1

at least one of a hydrogen and an inert gas so that a difference between top and bottom points of the roughness of the surface of the crystalline semiconductor film is 6 nm or less.

77. (New) The method for manufacturing the semiconductor device according to claim 76, wherein the inert gas is selected from the group consisting of nitrogen, argon, helium, neon, krypton and xenon.

78. (New) The method for manufacturing the semiconductor device according to claim 76, wherein the insulating layer is a single layer film structure or a stacked structure of two insulating films formed on a glass substrate.

79. (New) The method for manufacturing the semiconductor device according to claim 76, wherein the laser beam is a linear laser beam.

80. (New) The method for manufacturing the semiconductor device according to claim 76, wherein the crystalline semiconductor is heated at 450° to 600° after leveling the surface of the crystalline semiconductor.

81. (New) The method for manufacturing the semiconductor device according to claim 76, further comprising a step of hydrogenating the crystalline semiconductor film.

82. (New) A method for manufacturing a semiconductor device comprising:  
forming a crystalline semiconductor film over an insulating surface;  
irradiating the crystalline semiconductor film with a linear laser beam in a gas selected from at least one of a hydrogen and an inert gas to level a surface of the crystalline semiconductor film,  
wherein the crystalline semiconductor film is hydrogenated by a heating process.

83. (New) The method for manufacturing the semiconductor device according to claim 82 wherein the inert gas is selected from the group consisting of nitrogen, argon, helium, neon, krypton and xenon.

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 14

84. (New) The method for manufacturing the semiconductor device according to claim 82, wherein the insulating layer is a single layer film structure or a stacked structure of two insulating films formed on a glass substrate.

85. (New) The method for manufacturing the semiconductor device according to claim 82, wherein the crystalline semiconductor is heated at 450° to 600° after leveling the surface of the crystalline semiconductor.

86. (New) A method for manufacturing the semiconductor device comprising:  
disposing a substrate on a stage where a semiconductor film is formed over the substrate;

floating the substrate over the stage by supplying a gas to a side of the substrate which faces toward the stage;

irradiating the semiconductor film with a linear laser beam while the substrate is floated; and

moving the substrate while irradiating the semiconductor film with the linear laser beam.

87. (New) A method for manufacturing a semiconductor device according to claims 86, wherein the gas is jetted from holes in the stage.

88. (New) A method for manufacturing a semiconductor device according to claims 86, further comprising a step of eliminating dust from a surface of the semiconductor film by jetting a gas from a nozzle.

89. (New) A method for manufacturing a semiconductor device according to claims 86, wherein the semiconductor film is crystallized by the laser beam.

90. (New) A method for manufacturing a semiconductor device according to claims 86, wherein a surface of the semiconductor film is leveled by the laser beam.

Attorney Docket No. 740756-2683  
Serial No. 10/752,993  
Page 15

91. (New) A method for manufacturing a semiconductor device according to claims 86, wherein an oxidized film formed on the semiconductor film is abraded by the laser beam.

92. (New) A semiconductor device comprising:  
an insulating film formed on a glass substrate;  
a crystalline semiconductor film formed on the insulating film;  
a gate insulating film formed on the crystalline semiconductor film; and  
a conductive film formed on the gate insulating film,  
wherein a surface of the crystalline semiconductor film has a roughness, wherein the roughness has a difference between top and bottom points of 6 nm or less.

93. (New) A semiconductor device according to claim 92, wherein an oxide film is formed on the crystalline semiconductor film.

94. (New) A semiconductor device according to claim 92, wherein the crystalline semiconductor film is hydrogenated.

95. (New) A semiconductor device according to claim 92, wherein the glass substrate is 1200 x 1600 mm or 2000 x 2500 mm in length.

96. (New) A semiconductor device according to claim 92, wherein the semiconductor device is a display device.

97. (New) A semiconductor device according to claim 92, wherein the semiconductor device is an active matrix type liquid crystal display device.

98. (New) A semiconductor device according to claim 92, wherein the semiconductor device is an electronic apparatus selected from the group of a video camera, a digital camera, a rear type or front type projector, a head mount display, a personal computer, a portable information terminal, a mobile computer, a mobile telephone and an electronic book.

Attorney Docket No. 740756-2683

Serial No. 10/752,993

Page 16

99. (New) The method for manufacturing the semiconductor device according to claim 7, wherein the inert gas is selected from the group consisting of nitrogen, argon, helium, neon, krypton and xenon.

100. (New) The method for manufacturing the semiconductor device according to claim 13, wherein the inert gas is selected from the group consisting of nitrogen, argon, helium, neon, krypton and xenon.